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[Work-in-Progress] A Tool or a Friend? Investigating the Social and Psychological Influences of Students' GenAI Interactions in the Context of Engineering Undergraduate Education

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Abstract

This work-in-progress paper presents preliminary findings from a research project investigating the interplay between GenAI and human-to-human social interactions and their impact on socially constructed psychological concepts that significantly influence students' integration and retention (e.g., self-efficacy, connectedness, and engineering identity) in the context of engineering undergraduate education. The rapid adoption of generative AI (GenAI) is drastically reshaping engineering education, where students exhibit a higher frequency of GenAI interactions compared to those in other disciplines. The adoption of GenAI reshapes how students engage with technology and traditional human-to-human interactions. Student-GenAI interactions, characterized by their active and bidirectional nature, now encompass interactions that traditionally occurred with other humans in the educational environment (e.g., peers, faculty, staff, TAs, etc.). This represents a broader shift in engineering education, given that human-to-human social interactions serve as a primary mechanism of proximal learning and play a key role in the development of psychological concepts essential for long-term retention (i.e., self-efficacy, connectedness, and engineering identity) - both of which are critical components in engineering undergraduate education. Despite its significance - and increasing evidence in social psychology suggesting GenAI interactions' influence on human intuitions of social engagement - the literature in engineering education primarily focuses on how to integrate GenAI as a tool to enhance learning, rather than its social and psychological impacts on the broader educational ecosystem. To address this need, the larger research project adopts a concurrent mixed-methods approach, drawing on both closed- and open-ended survey responses from engineering undergraduate students at two R1 universities located in the northeastern and south-central regions of the United States. This work-in-progress paper presents the background, related literature, theoretical framework, and methods; and the conference presentation will further include preliminary findings from the ongoing data collection.

Backgrounds and Related Literature

GenAI as an Operating System for Learning

GenAI tools have been rapidly reshaping education. GenAI tools, such as ChatGPT, refers to AI that goes beyond traditional AI models by generating new data rather than solely analyzing or making predictions. Much of the current literature in engineering education conceptualizes GenAI primarily as a tool to support student learning, often treated as a tool with the capacity to interact, communicate, and generate content on demand [1], [2]. In contrast, an emerging scholarship positions GenAI as an operating system [3], [4], an underlying infrastructure that fundamentally reshapes and reorganizes students' learning processes, similar to how an operating system structures how applications run. Scholars adopting this perspective argue for a critical shift in how we think about and discuss GenAI - not as a single tool, but as an influential participant in the

educational ecosystem, with the potential to form a symbiotic relationship between humans and machines. From this viewpoint, GenAI serves as a foundational layer that shapes how students learn, think, and reason through their interactions with GenAI (GenAI interactions) embedded within everyday learning activities. Consequently, GenAI does more than transform the products of students' work as a tool. It is rewriting the affective, cognitive, and behavioral dimensions of learning through day-to-day GenAI interactions, which differs from human-to-human learning processes and thus necessitates critical investigation [1], [3], [4], [5]. Thus, the proposed adopts the perspective that views GenAI as an operating system that interacts with different components of the learning ecosystem, from system-level infrastructures to micro-level social interactions and individual-level beliefs and perceptions, investigating GenAI interactions with a focus on their social and psychological consequences among engineering undergraduate students.

Benefits and Risks of GenAI in Engineering Education

In engineering education, there has been a rapidly growing body of research investigating GenAI, reflected in the significant increase in publications in recent years [1]. The current literature primarily focuses on how to integrate GenAI tools into teaching and learning [6], [7], AI literacy and pedagogy [8], [9], [10], emerging ethical considerations [11], and students' and faculty's perceptions of GenAI use [12], [13]. Findings highlight advantages of GenAI integration, including encouraging self-directed learning and offering personalized feedback, while also identifying concerns related to knowledge acquisition and application, over-reliance to GenAI, academic integrity, ethical awareness, and critical thinking. Although these insights provide invaluable guidance on what to consider when integrating GenAI in learning and teaching, the prevailing attitude in much of the literature remains limited; conceptualizing GenAI primarily as a tool focused on its cognitive impacts [1], [3]. Consequently, GenAI's impacts within the broader educational ecosystem, beyond cognitive consequences, remain under-investigated, including its social and psychological consequences for students. This gap is problematic given that learning is inherently social, as explained by Vygotsky's sociocultural theory [14], which positions social interaction as a mechanism through which learners co-construct knowledge through dialogic engagement, while also considering the social mechanism of developing psychological constructs that has been consistently linked to learning and retention.

Social and Psychological Consequence of GenAI Interaction

According to a systematic review focused on the consequences of GenAI in computing education, only 8.5 % of the identified literature since 2022 (19 papers) focuses on social aspects of learning [1]. Similarly, in engineering education, our research team's current systematic review identified fewer than ten articles that directly or indirectly focus on the socio-psychological consequences of GenAI [15]. Although there are a few papers on GenAI focused on its impact on social aspect of learning, they provide invaluable insights on social consequence of GenAI integration or interactions. Regardless of the disciplines, there are negative consequences consistently mentioned across the paper, including reduced collaborations or interactions with other human beings significant to their learning, including peers, faculty, and TA. According to Hou et al.'s work in

the undergraduate computing education context [5], students expressed that their peer and faculty interactions within the class being affected by GenAI due to their over-reliance on GenAI to avoid the socioemotional barriers of help-seeking. Guo et al.'s findings from engineering undergraduate students further explains the reasons on students' preference for GenAI, including their immediacy, personalized responses, and streamlined cognitive demands [16]. Arora et al., [17] highlighted another aspect of GenAI interaction that hinders collaborations with teammates in the advanced computing class, i.e., compatibility issues between outputs generated by students and ChatGPT, which complicate integration and slow teamwork. Others reported that students feel pressured to use GenAI to keep up with their peers [18], increasing feelings of isolation while also leading them feeling guilty about their GenAI usage [19]. The findings collectively represent that students' interactions with GenAI, GenAI interaction, has been gradually reshaping peer interactions and collaborations in the process of learning, and potentially friendships, while also reflecting the varied perception toward GenAI, including a tutor, collaborator, to a mere technology.

Research Design

Research Purposes and Questions

Considering the significance of social and psychological aspects of learning that play critical roles in long-term learning and retention, this research aims to gain deeper insights into the social and psychological consequences of GenAI interactions. GenAI interactions are operationalized as social acts in which a student establishes a non-human social connection through communicative engagement with a GenAI agent, characterized by iterative, bi-directional exchanges between the student and the GenAI. To generate new exploratory understandings of the impact of GenAI interactions on social interactions and socially developed psychological constructs, i.e., self-efficacy, connectedness, and engineering identity (SCI), this study adopts a concurrent mixed-methods research approach, addressing the following research questions.

- **RQ 1.1:** What is the role and impact of GenAI in students' social networks?
- **RQ 1.2:** To what extent do GenAI-presence social interactions predict engineering undergraduate students' SCI, separately?
- **RQ 2.1:** How do they characterize these interactions for different purposes?
- **RQ 2.2:** How do students experience the interplay between GenAI and their social interactions, and the impacts of GenAI-present social interactions on their psychological dynamics (i.e., SCI)? and why?

Theoretical Frameworks

This study is grounded in Vygotsky's Sociocultural Theory [14] and the concept of parasocial relationships [20]. According to Vygotsky's Sociocultural Theory [14], social interactions are not merely an auxiliary strategy but a core mechanism through which learners access and co-construct knowledge via dialogic engagement within their Zone of Proximal Development. This dialogic process has been shown to enhance socially shared regulation of learning, in which students jointly plan, monitor, and assess their work. Such collaboration encourages distributed metacognition and prompts learners to engage in strategic regulation that may not emerge in solitary settings,

underscoring the critical role of social interaction in learning. To explain the impact of GenAI interactions on social interactions, this study adopts the concept of Parasocial Relationships [20], which refers to a one-sided form of interpersonal interaction in which an audience unilaterally establishes a connection with media figures. With the widespread adoption of GenAI, this concept has been extended to examine human interactions not only with media figures but also with GenAI [21], [22], [23] in the field of human–computer interaction. Aligning with prior studies, the current study posits that parasocial relationships are no longer confined to unidirectional communication but have gradually evolved into more complex, bidirectional interactions [24], [25], due to the interactive and collaborative nature of GenAI, which generates new data in partnership with humans.

Research Methods

The current concurrent mixed-methods research consists of a qualitative strand using a thematic analysis of open-ended responses and a quantitative strand that analyze close-ended responses using a social network and statistical analysis. The quantitative strand aims to examine how students' perception of GenAI and characterization of AI interaction are related to human-to-human social interactions and SCI. (RQs 1.1 and 1.2). The qualitative strand seeks to understand the students' perceived characteristics of GenAI interactions and their perceptions of how and why GenAI use influences their socio-psychological dynamics in their undergraduate education (RQs 2.1 and 2.2). Data collection is currently in-progress, collecting closed- and open-ended survey responses from engineering undergraduate students at the selected two R1 universities located in the northeastern and south-central regions of the United States. Existing instruments measuring students' self-efficacy [26], connectedness [27], and engineering identity [28] were adopted and modified for engineering undergraduate students.

Conclusion and Next Steps

The majority of traditional theories of how people learn, such as Vygotsky's Sociocultural theory [14], explain social interaction as a mechanism through which learners co-construct knowledge through dialogic engagement. However, the current literature has not yet addressed the most pressing question: whether *students' GenAI interactions impact their human-to-human social interactions in learning environments that are known to be core mechanisms for learning and for developing psychological constructs critical to long-term learning*. Positioning GenAI as an operating system with potential influence on the social aspects of the learning process raises another critical question: whether there may be consequential impacts on students' social interactions and psychological constructs that develop through social interactions, including self-efficacy, connectedness, professional identity, and motivation. The conference presentation will present findings from a pilot study, suggesting evidence-based strategies for encouraging students to adopt helpful and productive uses of GenAI, while discouraging them from adopting harmful uses in the context of engineering undergraduate education. These insights are intended for researchers, educators, and practitioners seeking to balance technological innovation with human connection.

References

[1] J. Álvarez Ariza, M. Benitez Restrepo, and C. Hernández Hernández, "Generative AI in Engineering and Computing Education: A Scoping Review of Empirical Studies and Educational Practices," *IEEE Access*, vol. 13, pp. 30789–30810, 2025, doi: 10.1109/ACCESS.2025.3541424.

[2] P. Lauren and P. Watta, "Work-in-Progress: Integrating Generative AI with Evidence-based Learning Strategies in Computer Science and Engineering Education," in *2023 IEEE Frontiers in Education Conference (FIE)*, College Station, TX, USA: IEEE, Oct. 2023, pp. 1–5. doi: 10.1109/FIE58773.2023.10342970.

[3] A. Bozkurt *et al.*, "The Manifesto for Teaching and Learning in a Time of Generative AI: A Critical Collective Stance to Better Navigate the Future," *Open Prax.*, vol. 16, no. 4, pp. 487–513, Nov. 2024, doi: 10.55982/openpraxis.16.4.777.

[4] A. Bozkurt and R. C. Sharma, "Trust, Credibility and Transparency in Human-AI Interaction: Why We Need Explainable and Trustworthy AI and Why We Need It Now?".

[5] I. Hou *et al.*, "'All Roads Lead to ChatGPT': How Generative AI is Eroding Social Interactions and Student Learning Communities," in *Proceedings of the 30th ACM Conference on Innovation and Technology in Computer Science Education V. 1*, in ITiCSE 2025. New York, NY, USA: Association for Computing Machinery, Jun. 2025, pp. 79–85. doi: 10.1145/3724363.3729024.

[6] R. Choudhuri, D. Liu, I. Steinmacher, M. Gerosa, and A. Sarma, "How Far Are We? The Triumphs and Trials of Generative AI in Learning Software Engineering," 2023, doi: 10.48550/ARXIV.2312.11719.

[7] S. Aggrawal and A. J. Magana, "Teamwork Conflict Management Training and Conflict Resolution Practice via Large Language Models," *Future Internet*, vol. 16, no. 5, p. 177, May 2024, doi: 10.3390/fi16050177.

[8] M. Pinski, M. Adam, and A. Benlian, "AI Knowledge: Improving AI Delegation through Human Enablement," in *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*, Hamburg Germany: ACM, Apr. 2023, pp. 1–17. doi: 10.1145/3544548.3580794.

[9] M. C. Laupichler, A. Aster, and T. Raupach, "Delphi study for the development and preliminary validation of an item set for the assessment of non-experts' AI literacy," *Comput. Educ. Artif. Intell.*, vol. 4, p. 100126, 2023, doi: 10.1016/j.caeai.2023.100126.

[10] J. Dodge *et al.*, "After-Action Review for AI (AAR/AI)," *ACM Trans. Interact. Intell. Syst.*, vol. 11, no. 3–4, pp. 1–35, Dec. 2021, doi: 10.1145/3453173.

[11] Quince, Z., Petkoff, K., Michael, R. N., Daniel, S., & Nikolic, S., "The current ethical considerations of using GenAI in engineering education and practice: A systematic literature review.," presented at the he 35th annual conference of the Australasian association for engineering education (AAEE 2024), Dec. 2024.

[12] J. M. Lodge, K. Thompson, and L. Corrin, "Mapping out a research agenda for generative artificial intelligence in tertiary education," *Australas. J. Educ. Technol.*, vol. 39, no. 1, pp. 1–8, May 2023, doi: 10.14742/ajet.8695.

[13] J. Prather *et al.*, "The Robots Are Here: Navigating the Generative AI Revolution in Computing Education," in *Proceedings of the 2023 Working Group Reports on Innovation and Technology in Computer Science Education*, Turku Finland: ACM, Dec. 2023, pp. 108–159. doi: 10.1145/3623762.3633499.

[14] L. S. Vygotsky, *Mind in Society: Development of Higher Psychological Processes*. Harvard University Press, 1980. doi: 10.2307/j.ctvjf9vz4.
[15] E. Lee and E. Rowley, "[Work-in-Progress] The Impacts of Students' GenAI Interactions on Their Interpersonal Interactions: Preliminary Findings from a Systematic Review and Its Impactions for Engineering and Computer Science Education," presented at the the 2026 ASEE Annual Conference & Exposition, Charlotte, NC, Jun. 2026.
[16] M. Guo, W. Chow, H. Samadi, A. Atiq, and T. Linden, "Personalized, Accessible, but Imperfect: Why Students Turn to GenAI for Academic Help," 2025.
[17] U. Arora *et al.*, "Analyzing LLM Usage in an Advanced Computing Class in India," in *Proceedings of the 27th Australasian Computing Education Conference*, Brisbane Australia: ACM, Feb. 2025, pp. 154–163. doi: 10.1145/3716640.3716657.
[18] A. Padiyath *et al.*, "Insights from Social Shaping Theory: The Appropriation of Large Language Models in an Undergraduate Programming Course," in *Proceedings of the 2024 ACM Conference on International Computing Education Research - Volume 1*, Melbourne VIC Australia: ACM, Aug. 2024, pp. 114–130. doi: 10.1145/3632620.3671098.
[19] D. Palacios-Alonso, J. Urquiza-Fuentes, J. Á. Velázquez-Iturbide, and J. Guillén-García, "Experiences and Proposals of Use of Generative AI in Advanced Software Courses," in *2024 IEEE Global Engineering Education Conference (EDUCON)*, Kos Island, Greece: IEEE, May 2024, pp. 1–10. doi: 10.1109/EDUCON60312.2024.10578869.
[20] D. Horton and R. Richard Wohl, "Mass Communication and Para-Social Interaction: Observations on Intimacy at a Distance," *Psychiatry*, vol. 19, no. 3, pp. 215–229, Aug. 1956, doi: 10.1080/00332747.1956.11023049.
[21] T. Qi, H. Liu, and Z. Huang, "An assistant or A friend? The role of parasocial relationship of human-computer interaction," *Comput. Hum. Behav.*, vol. 167, p. 108625, Jun. 2025, doi: 10.1016/j.chb.2025.108625.
[22] M. G. Smith, T. N. Bradbury, and B. R. Karney, "Can Generative AI Chatbots Emulate Human Connection? A Relationship Science Perspective," *Perspect. Psychol. Sci.*, vol. 20, no. 6, pp. 1081–1099, Nov. 2025, doi: 10.1177/17456916251351306.
[23] M. D. Chu, P. Gerard, K. Pawar, C. Bickham, and K. Lerman, "Illusions of Intimacy: Emotional Attachment and Emerging Psychological Risks in Human-AI Relationships," Jun. 10, 2025, *arXiv*: arXiv:2505.11649. doi: 10.48550/arXiv.2505.11649.
[24] J. W. Kassing and J. Sanderson, "'You're the Kind of Guy That We All Want for a Drinking Buddy': Expressions of Parasocial Interaction on Floydlandis.com," *West. J. Commun.*, vol. 73, no. 2, pp. 182–203, May 2009, doi: 10.1080/10570310902856063.
[25] E. S. Daniel Jr., Steph Orme, and Arienne Ferchaud, "Why can't we be friends (with streamers): Content creators and streamers' perception of parasocial relationships and audience management," *MedieKultur J. Media Commun. Res.*, vol. 40, no. 78, May 2025, doi: 10.7146/mk.v40i78.136534.
[26] A. R. Carberry, H. Lee, and M. W. Ohland, "Measuring Engineering Design Self-Efficacy," *J. Eng. Educ.*, vol. 99, no. 1, pp. 71–79, Jan. 2010, doi: 10.1002/j.2168-9830.2010.tb01043.x.
[27] E. Knekta, K. Chatzikyriakidou, and M. McCartney, "Evaluation of a Questionnaire Measuring University Students' Sense of Belonging to and Involvement in a Biology Department," *CBE—Life Sci. Educ.*, vol. 19, no. 3, p. ar27, Sep. 2020, doi: 10.1187/cbe.19-09-0166.

[28] A. Godwin, “The Development of a Measure of Engineering Identity,” in *2016 ASEE Annual Conference & Exposition Proceedings*, New Orleans, Louisiana: ASEE Conferences, Jun. 2016, p. 26122. doi: 10.18260/p.26122.
[29] P. Brown and H. Matusovich, “Unlocking Student Motivation: Development of an Engineering Motivation Survey,” in *2013 ASEE Annual Conference & Exposition Proceedings*, Atlanta, Georgia: ASEE Conferences, Jun. 2013, p. 23.1284.1-23.1284.17. doi: 10.18260/1-2--22669.